#435

Grading Permit #5525

MILILANI TOWN MULTI-FAMILY MF-18
PRELIMINARY SOIL REPORT

WAIPIO, EWA, OAHU, HAWAII
TAX MAP KEY: 9-4-05: POR. 1 & 3

To:
MILILANI TOWN, INCORPORATED

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

JANUARY 28, 1972

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
EZRA KOIKE

3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

January 28, 1972

MR. GENE FERGUSON
Mililani Town, Inc.
P. O. Box 2780
Honolulu, Hawaii 96803

Dear Mr. Ferguson:

Subject: Mililani Town Multi-Family MF-18
Preliminary Soil Report
(for site grading purposes)
Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

In accordance with your request, soil explorations were made to determine general soil conditions at the future townhouse development site for Mililani Town Multi-Family MF-18.

The surface soils at the site may be generally described as medium to stiff reddish-brown clayey silts ("MH" soils).

For light, short span wood frame structures, spread or continuous footings may be used. If heavy structures are contemplated, supplementary borings should be made at a later date when plans for the site are developed and the types and locations of structures are determined.

Some grading and filling of the site are contemplated. The earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein.

This report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

C O N T E N T S

MILILANI TOWN MULTI-FAMILY MF-18
PRELIMINARY SOIL REPORT

WAIPIO, EWA, OAHU, HAWAII
TAX MAP KEY: 9-4-05: POR. 1 & 3

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for site grading for the proposed Mililani Town Multi-Family MF-18.

This report includes field explorations, laboratory tests and general recommendations for site grading and preliminary foundation design considerations.

FIELD EXPLORATION

Seven exploratory borings were made at the site. The locations of these borings are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on the boring logs.

Borings were made with 3 and 4-in. diameter augers using a carbide drag bit. Soil samples were recovered with 2-in. diameter thin-wall tube samplers and a standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content and density, unconfined compression, Atterberg limit, sieve analysis, AASHO T-180-57 density, expansion and CBR.

A list of the standard field and laboratory test methods used for this project is given in the Appendix.

A summary of the laboratory test results is given in Tables IA and IB.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The proposed site is located about 1/8 mile east of Kamehameha Highway and about 1/4 mile north of Kipapa Gulch.

The site was a former pineapple field. Haul roads were noted on the site during the field explorations.

The existing ground generally slopes down from north to south at about a 2% grade with variations in localized areas. At the west boundary, the ground slopes down to a natural drainageway at about a 6% grade.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils may be generally described as follows:

Medium to stiff reddish-brown clayey silts ("MH" soils) to about 30 ft, the depths drilled.

Water was not noted in the borings during the field explorations.

For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

In general, the present plan is to clear and grade the site for a future townhouse development.

The on-site soils, in general, will have sufficient strength to support light, short-span, wood frame structures, provided the site is cleared and grubbed, drained and localized soft spots are removed.

Site Grading

Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling. Localized soft pockets encountered during the site preparations should be excavated and backfilled with compacted select material. Provisions to drain the site should be included during and after the completion of filling operations.

In general, the on-site soils may be used for the construction of the proposed fills. Grading work should be done as required by the F.H.A. Data Sheet 79-G; Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. The area should be cleared and grubbed.

2. Topsoil and stockpiled soils should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

3. Hard surfaces of existing haul roads should be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

4. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should continually be keyed into the stiff

natural ground by cutting steps into the slopes and compacting the fill into these steps.

5. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

If slope heights (top to toe) of greater than 20 ft are considered, 8-ft-wide benches should be placed at height intervals of about 15 ft.

To minimize erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments or other precautions may be necessary if seepage zones or soft spots are encountered in localized areas.

Foundations

For light, short span, wood frame structures, spread or continuous footing foundations may be considered.

Additional explorations may be made as plans for the site are developed and structures other than light wood frames are contemplated.

Guide recommendations for preliminary foundation design considerations are as follows:

1. Because of the downhill creep effect of soils on a slope, buildings should be placed about 15 ft from the tops of slopes. This distance may be reduced for lower slope heights, e.g. 10 ft for 10-ft-high slopes, but in no case closer than 5 ft from the top of a slope.

2. Footings should be placed on existing stiff ground or on well-compacted fill. The bottom of footings should be about 2 ft below finish grade. Minimum footing widths of about 3 ft

should be considered for individual spread footings and about 18 in. for continuous wall footings.

3. To minimize effects of differential settlements, deep grade beams are recommended, particularly around the perimeter of the building.

4. Construction of retaining walls on side slopes should be avoided.

5. Good surface drainage away from the foundations of the proposed structure should be maintained and the site should be graded at all times to prevent ponding of water.

Concrete Slabs on Ground

Slabs on ground should be separated from grade walls, beams and column footings.

For concrete slabs on ground, a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size is recommended.

The subgrade should be compacted and shaped to drain. The elevation of the subgrade should be kept higher than the surrounding ground outside the building whenever practicable.

Underground Utilities

Underground utilities should be placed after the fills are constructed.

The bottoms of utility trenches along the tops of slopes should be daylighted and graded to shed water. The backfill and drainage of these utility trenches should be carefully designed.

Flexible connections should be used.

Roadways

In general, a rough estimate of the roadway pavement thickness for the light automobile traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding subbase requirements in the field as ground conditions are exposed at subgrade levels.

It is recommended that subgrades be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels through the walls of the catch basins which are placed in these low areas.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

PROPOSED SPECIFICATION FOR EARTHWORK

MILILANI TOWN MULTI-FAMILY MF-18

General Description

This item shall consist of clearing and grubbing, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary for grading the site.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, rubbish and miscellaneous material shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. Loose surface soils encountered at finish grade shall be scarified and recompacted.

Hard surfaces of existing haul roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

Materials

Fill material shall consist of selected on-site soils or approved borrow soils. The soils shall contain no more than a trace of organic and deleterious matter.

Borrow soils shall be select soils generally less than 3-in. maximum size, with more than 30% fines and a plasticity index generally less than 20.

Fill material placed in the top 2 ft of fills shall contain less than 30% gravel.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

Rocks or cobbles shall not be allowed to nest and voids between rocks shall be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be compacted to 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to obtain the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Excavation

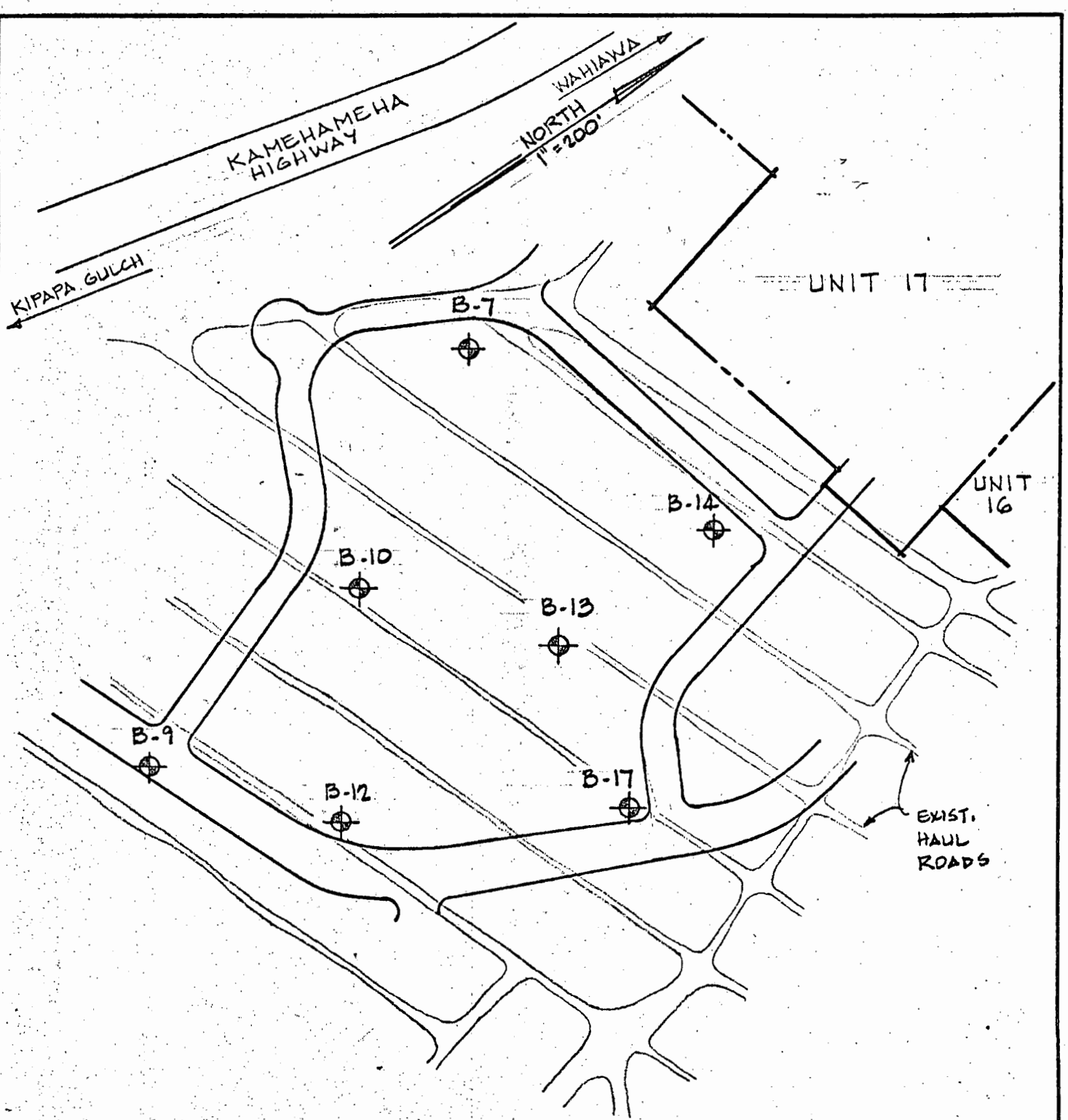
Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be disposed of.

Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots, seepage water or expansive soil pockets are encountered, corrective measures shall be made in the field as they are detected.

Rainy Weather

Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.



BORING LOCATION PLAN
MILILANI TOWN MULTI-FAMILY MF-18
WAIPIO, EWA, OAHU, HAWAII
TMK: 9-4-05: POR. 1 & 3

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

JANUARY, 1972

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

MILILANI TOWN UNIT MULTI-FAMILY MF-

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2"S- 2" O.D. THIN WALL TUBE
2"SS- 2" STANDARD SPLIT SPOON

BORING NO. 7 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN. 6, 1972
Field Party GLORY, COLLURA
Type of Boring AUGER (MOBILE B-30) Diam. 4"
Elev. 568'±* Datum —
Drill Bit T.C. DRAG

Water Level				
Time	—			
Date	1-6-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 568'±*	0									
(MH)	MEDIUM DARK REDDISH BROWN CLAYEY SILT		2"SS	7-A	=	37	—	—	—		
		5	2"S	7-B	125	32	95	14,670	—		5/.5' 15/.5'
(MH)	STIFF, TAN & REDDISH BROWN CLAYEY SILT	10	2"SS	7-C	—	39	—	—	—	—	
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT	15	2"S	7-D	108	48	73	4590	-		6/.5' 7/.5'
	END OF BORING @ 16.0'										

*ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71

MILILANI TOWN UNIT -18

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

HAMMER:
Weight 140*
Drop 30"
SAMPLER: 2'SS - 2" STANDARD SPLIT SPOON
2'S - 2" THIN WALL TUBE

BORING NO. 9 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN. 5, 1972
Field Party GLORY, COLLURA
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 566' ± * Datum —
Drill Bit T.C. DRAG

Water Level					
Time	—				
Date	1-5-72				

Unified Soil Classification	DESCRIPTION ELEV. = 566' ± *	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
			2'SS	9-A	-	36	-	-	-		
(MH)	STIFF, DARK REDDISH BROWN CLAYEY SILT	5	2'S	9-B	129	38	94	6870	-		4/1.5' 8/1.5'
(MH)	STIFF, BROWN CLAYEY SILT	10	2'SS	9-C	-	37	-	-	-		
		15	2'S	9-D	-	36	-	-	-		15/1.5'
	END OF BORING @ 15.5'										

*ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71

MILILANI TOWN - UNIT 18

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS - 2"O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 10 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN. 11, 1972
Field Party GLORY, COLLURA
Type of Boring AUGER (MOBILE B-40) Diam. 4"
Elev. 574'± * Datum ____
Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	—			
Date	1-11-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2"O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 574'± *	0									
(MH)	MEDIUM, DARK BROWN CLAYEY SILT		2"SS	10-A	-	33	-	-	-		
		5	2"S	10-B	114	36	83	7410	-		12/5' 14/5'
		10	2"SS	10-C	-	40	-	-	-		
MH	STIFF, REDDISH BROWN & TAN, CLAYEY SILT					LL= 55 PL= 39					
		15	2"S	10-D	124	41	88	5950	-		12/5' 15/5'
MH	STIFF, BROWN CLAYEY SILT	20	2"SS	10-E	-	38	-	-	-		
						LL= 89 PL= 50					
	LIGHT BROWN DECOMPOSED ROCK (SOME CRUSHES TO CLAYEY SILT)	25	2"S	10-F	113	36	83	-	-		8/5' 14/3' HAMMER BOUNCES
	END OF BORING @ 25.8'										
	*ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71										

MILILANI TOWN — UNIT 1

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

BORING NO. 12 Sheet No. ____ of ____
Driller W.LUM ASSOC. INC. Date JAN. 8. 1972
Field Party KAKU, TSUKAZAKI
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 56B'±* Datum —
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time —
Date 1-8-72

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2"S5 = 2" O.D. THIN WALL TUBE
2"SS = 2" STANDARD SPLIT SPOON

Unified Soil Classification	DESCRIPTION ELEV. = 56B'±*?	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test / 2" O.D. THIN WALL TUBE SAMPLER — N (Blows per foot) 0 10 20 30 40 — BLOWS/.5'
(MH)	MEDIUM, DARK REDDISH BROWN CLAYEY SILT	0	2"S	12-A	95	38	69	2340	—	21.5, 21.5
(MH)	STIFF, MOTTLED LIGHT BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	5	2"SS	12-B	—	28	—	—	—	53
(MH)	STIFF, REDDISH BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	10	2"SS	12-C	—	32 31	—	—	—	10/.5' 28/.5'
(MH)	STIFF, BROWN CLAYEY SILT	15	2"SS	12-D	—	30	—	—	—	30/.4'
	END OF BORING @ 15.4'									
	*ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71									

MILILANI TOWN, UNIT-18

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

BORING NO. 13 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN 12, 1972
Field Party GLORY, COLLURA
Type of Boring AUGER (MOBILE B-40) Diam. 4"
Elev. 576'± * Datum —
Drill Bit J.C. DRAG
Water Level NOT NOTICED
Time —
Date 1-12-72

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2"SS - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 576'± *	0									
(MH)	MEDIUM DARK REDDISH BROWN CLAYEY SILT		2"SS	13-A	—	36	—	—	—		
(MH)	STIFF REDDISH-BROWN CLAYEY SILT	5	2"S	13-B	—	36	—	—	—		15/.5'
		10	2"SS	13-C	—	29	—	—	—		
(MH)	STIFF, LIGHT REDDISH BROWN CLAYEY SILT	15	2"S	13-D	—	28	—	—	—		8/.5', 15/.5
	END OF BORING @ 16.0'										

* ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71

MILILANI TOWN - UNIT 18

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

HAMMER:
Weight 140 #
Drop 30"
SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON 2"S - 2" O.D. THIN WALL TUBE

BORING NO. 14 Sheet No. ____ of ____
Driller W. LUM ASSOC. INC. Date JAN. 12, 1972
Field Party GLORY, COLLURA
Type of Boring AUGER (MOBILE B-40) Diam. 4"
Elev. 577' ± * Datum —
Drill Bit J.C. DRAG

Water Level	NOT NOTICED			
Time	—			
Date	1-12-72			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40 / 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 577' ± *	0								
MH	MEDIUM DARK REDDISH BROWN CLAYEY SILT		2"SS	14-A	—	36 LL= 65 PL= 37	—	—	—	
MH	STIFF LIGHT REDDISH BROWN CLAYEY SILT	5	2"S	14-B	—	33 LL= 62 PL= 38	—	—	—	9/.5', 20/.5'
(MH)	STIFF, MOTTLED LIGHT REDDISH-BROWN CLAYEY SILT	10	2"SS	14-C	—	37	—	—	—	45
(MH)	STIFF, BROWN CLAYEY SILT									
(MH)	STIFF, MOTTLED DARK REDDISH-BROWN CLAYEY SILT	15	2"S	14-D	—	34	—	—	—	9/.5', 17/.5
	END OF BORING @ 16.0'									

* ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71

MILILANI TOWN - UNIT 18

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: MILILANI TOWN MULTI-FAMILY MF-18
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-05: Por. 1 & 3

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2'S - 2" O.D. THIN WALL TUBE
2'SS - 2" STANDARD SPLIT SPOON

BORING NO. 17 Sheet No. ____ of ____
Driller W.LUM ASSOC., INC. Date JAN. 6 & 7, 1972
Field Party GLORY, COLLURA
Type of Boring AUGER (MOBILE B-30) Diam. 4"
Elev. 575'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	1-6-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 575'± *2										
(MH)	MEDIUM DARK REDDISH BROWN CLAYEY SILT		2"SS	17-A	-	33	-	-	-		
MH	STIFF, REDDISH BROWN SILTY CLAY	5	2"S	17-B	110	34 LL= 71 PL= 35	83	6050	-		10/.5'
(MH)	STIFF, LIGHT REDDISH BROWN CLAYEY SILT	10	2"SS	17-C	-	30	-	-	-		53
		15	2"S	17-D	118	39	85	-	-		5/.5' 12/.5'
MH	STIFF, MOTTLED LIGHT REDDISH BROWN CLAYEY SILT	20	2"SS	17-E	-	42	-	-	-		30/.5'
		25	2"S	17-F	115	43 45	-	6940	-		6/.5' 9/.5'
(MH)	STIFF, MOTTLED GRAY BROWN CLAYEY SILT	30	2"SS	17-G	-	53	-	-	-		
	END OF BORING @ 31.5'										
	* ELEVATION ESTIMATED FROM PRELIM. PLAT DATED 9-15-71										

MILILANI TOWN MULTI-FAMILY MF-18

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	10	10	10	
SAMPLE NO.		C	E	
DEPTH BELOW SURFACE	SURFACE	10'- 11.5'	20'- 21.5'	
DESCRIPTION	DARK REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN & TAN CLAYEY SILT	BROWN CLAYEY SILT	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"	100			
1/2"	100			
#4	100			
#10	99.8			
#20	99.0			
#40	98.5			
#100	96.6			
#200	95.4			
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	61	55	89	
Plastic Limit	35	39	50	
Plasticity Index	26	16	39	
Dilatancy	MED.-QUICK	QUICK	MED.-QUICK	
Toughness	MEDIUM	SLIGHT	SLIGHT-MED.	
Dry Strength	MEDIUM	SLIGHT-MED.	SLIGHT-MED.	
UNIFIED SOIL CLASSIFICATION	MH	MH	MH	
APPARENT SPECIFIC GRAVITY	2.80			
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	29.9			
Molding Dry Density, P.C.F.	93.6			
Swell upon saturation, %	0.2			
CBR at 0.1" Penetration	21.2			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)	A			
Dry to Wet or Wet to Dry	WET TO DRY			
Max. Dry Density (P.C.F.)	96.3			
Optimum Moisture (%)	28.0			

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 1-28-72 By BT.

MILILANI TOWN MULTI-FAMILY, MF-18

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	14	14	17	17
SAMPLE NO.	A	B	B	F
DEPTH BELOW SURFACE	0.5'-2'	5'-6'	5'-5.5'	25'-26'
DESCRIPTION	DARK REDDISH-BROWN CLAYEY SILT	LIGHT REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN SILTY CLAY	MOTTLED LIGHT REDDISH-BROWN CLAYEY SILT
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	65	52	71	98
Plastic Limit	37	38	35	53
Plasticity Index	28	14	36	45
Dilatancy	MEDIUM	QUICK	MEDIUM	QUICK
Toughness	MEDIUM	SLIGHT	MED.-HIGH	SLIGHT-MED.
Dry Strength	MEDIUM	SLIGHT-MED.	MED.-HIGH	MEDIUM
UNIFIED SOIL CLASSIFICATION	MH	MH	MH	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

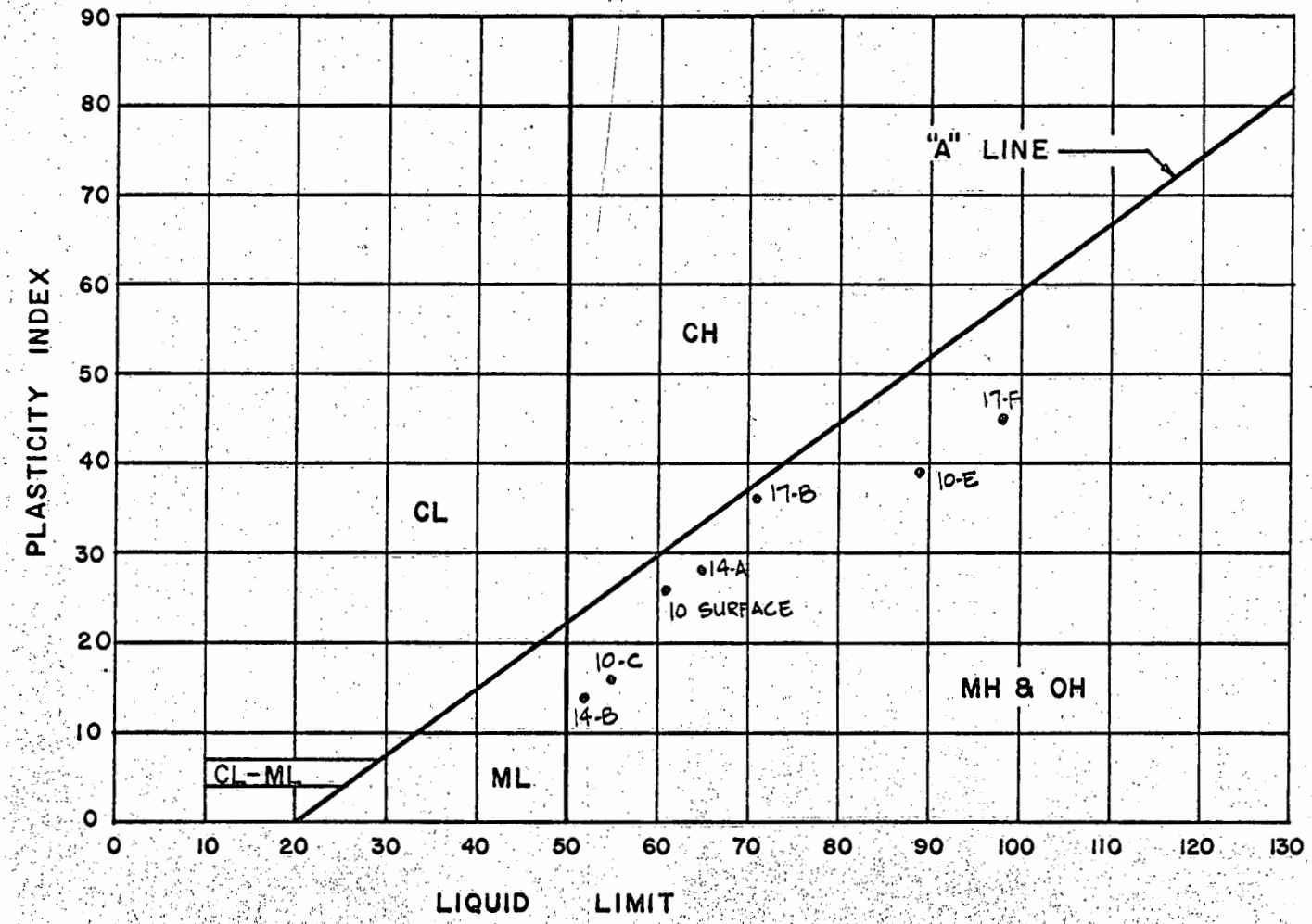
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 1-28-72 By BT

PLASTICITY CHART

PROJECT: MILILANI TOWN MULTI-FAMILY, MF-18

LOCATION: WAIPIO, EWA, OAHU, HAWAII



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DATE 1-28-72 BY BT

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

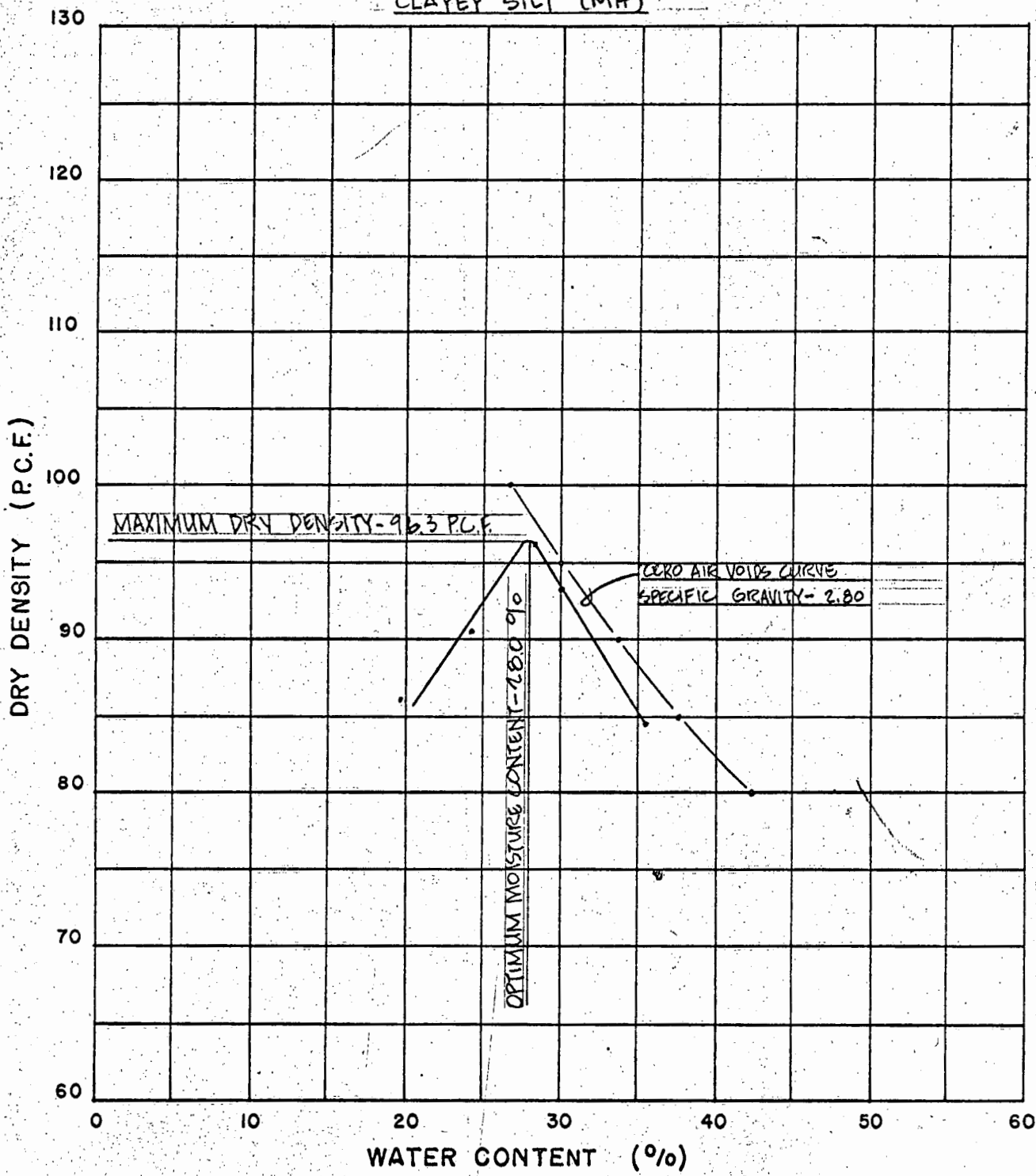
PROJECT: MILILANI TOWN MULTI-FAMILY MF-18

LOCATION: WAIPIO-EWA, OAHU, HAWAII

SAMPLE NO.: 10 (SURFACE)

SAMPLE DESCRIPTION: DARK REDDISH BROWN CLAYEY SILT (MH)

AGGREGATE: ¼" MINUS
MOLD SIZE: 4" ϕ 4.59" HIGH
HAMMER: 10 LBS., 18" DROP
LAYERS: 5
BLOWS: 25/LAYER



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DATE 1-14-72 BY SK

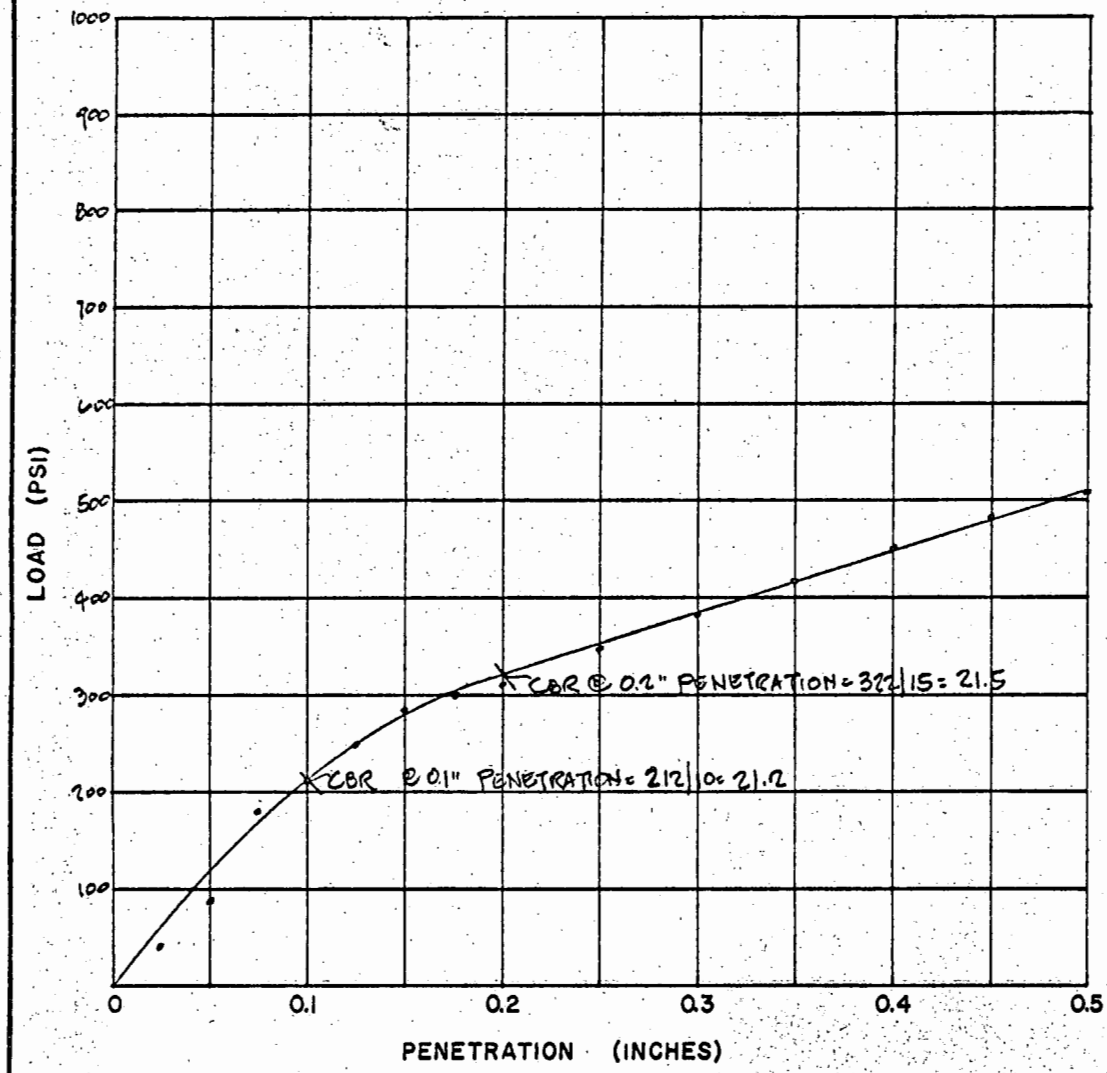
CBR TEST

PROJECT: MILILANI TOWN MULTI-FAMILY - MF-18

LOCATION: WAIPIO-EWA, OAHU, HAWAII

SAMPLE NO: 10 (SURFACE)

SAMPLE DESCRIPTION: DARK REDDISH-BROWN CLAYEY SILT (MH)



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS)	LOAD (PSI)
0.025	120	40
0.050	260	87
0.075	550	183
0.100	630	210
0.125	750	250
0.150	850	283
0.175	900	300
0.200	930	310
0.250	1040	347
0.300	1160	383
0.350	1250	417
0.400	1360	453
0.450	1450	483
0.500	1520	507

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 29.9

MOLDING DRY DENSITY, P.C.F. 93.6

CBR @ 0.1" PENETRATION 21.2

DAYS SOAKED 4

DATE 1-13-72 BY MO

DATE 1-18-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

GENERAL TESTING METHODS

EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling by auger borings (Tentative)	ASTM Designation: D 1452-63T
Method for thin wall tube sampling of soils (Tentative)	ASTM Designation: D 1587-63T
Method for penetration test and split barrel sampling of soils (Tentative)	ASTM Designation: D 1586-64T

LABORATORY TESTING

Grading Analysis

Sieve analysis of fine and coarse aggregates	AASHO Designation: T 27-60
Amount of material finer than No. 200 sieve in aggregate	AASHO Designation: T 11-60

Atterberg Limits

Determining the liquid limit of soils Modified as follows: Substitute Casagrande grooving tool. Tests conducted from natural moisture content unless noted otherwise.	AASHO Designation: T 89-60
Determining the plastic limit of soils	AASHO Designation: T 90-56
Calculating the plasticity index of soils	AASHO Designation: T 91-54

Specific Gravity

Specific gravity of soils Modified as follows: 500 ML Pycnometer	AASHO Designation: T 100-60

Expansion and CBR Tests

Expansion test and California Bearing Ratio (CBR)	Section VIII - TM 5-530 "Materials Testing" by Headquarters, Dept. of the Army

Compaction Test

Moisture-Density relations of soils using a 10# rammer and an 18" drop	AASHO Designation: T 180-57

Unified Soil Classification

Designation E-3 from "Earth Manual" by the United States Department of the Interior Bureau of Reclamation

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.